# River Sojourns and Water Trails: Linking River Experiences and Academic Learning

**The Importance of Environmental Education and the Potomac River Sojourn**

The importance of exposing our children to the rich mystery that is the natural world becomes more evident every day. Human environmental impacts are taking their toll on our natural resources at an alarming rate. Through increased access to environmental education, teachers can promote awareness for environmental issues and inspire environmentally responsible behavior in their students.

"Environmental education is a learning process that increases people's knowledge and awareness about the environment and associated challenges, develops the necessary skills and expertise to address the challenges, and fosters attitudes, motivations, and commitments to make informed decisions and take responsible action. Environmental education enhances critical thinking, problem-solving, and effective decision-making skills, and teaches individuals to weigh various sides of an environmental issue to make informed and responsible decisions"(http://www.gdrc.org/uem/ee/4-1.html).

By exposing students to environmentally-based hands-on activities in the classroom and in the field, teachers provide the means to inspire not only awareness and sensitivity to the many environmental challenges facing our society, but to inspire stewardship to become involved in the process of conservation, restoration, and education efforts. Environmental learning experiences can provide an awareness of the interconnectedness of nature and how each person plays a part in conservation.

"Environmental education, properly understood, should constitute a comprehensive lifelong education, one responsive to changes in a rapidly changing world. It should prepare the individual for life through an understanding of the major problems of the contemporary world, and the provision of skills and attributes

needed to play a productive role towards improving life and protecting the environment with due regard given to ethical values." http://www.gdrc.org/uem/ee/4-1.html).

**Sojourns and Water Trail Experiences as Teacher Training Opportunities**

One of the most important ways to inspire stewardship and learn the subtleties of a body of water is to simply be in it. Once you experience a sunrise, see the silhouette of a heron in the distance, feel a slight breeze down a river corridor on your warm cheek, hear the leaves of the trees lining the bank rustling above--do you fall in love with a body of water. Sure, you might have heard different facts and figures about this particular water body, you might have studied it in a textbook, but until you actually experience it, the river does not fully come alive. Teachers have the opportunity to experience the Potomac River on a Sojourn and bring their enthusiasm and deeper knowledge of the river back to their students. The students can then experience the beauty and mystery of the natural world right outside their classroom doors, in their schoolyard and surrounding community. It is the teachers' spark that will then light the flame of enthusiasm and passion for environmental education, restoration and conservation for a lifetime.

Potomac River Sojourns specifically and Potomac River Water Trail experiences generally have the potential to offer unique opportunities for teachers from the District of Columbia, Virginia and Maryland to conduct and become exposed to a variety of hands-on environmental monitoring and restoration activities for use in the classroom and future field studies. The Potomac River offers a dynamic environment in which to become exposed to various topics and educational disciplines; it provides a unique training opportunity in which teachers can gain the confidence and skills to perform various environmental monitoring projects and to develop lesson plans and ideas for use in classroom settings.

**River Sojourns and Water Trails: Unique Outdoor Classrooms**

*River Sojourns Organized by the Alliance for the Chesapeake Bay*

Since 1990 the Alliance for the Chesapeake Bay has worked with local river conservation organizations across the watershed to hold week long paddling and camping trips that celebrate the rich history and ecology of the rivers that make the Chesapeake Bay unique. The Alliance Sojourns incorporate environmental education in an effort to raise awareness of the river's natural resources and to increase watershed stewardship, seeking to develop a more informed and environmentally conscious citizenry. Using experience and involvement with kindred organizations in Virginia, Maryland, and Washington D.C., the Alliance highlights various conservation and restoration efforts along the tributaries of the Bay such as the Susquehanna, Potomac, Patuxent, and James Rivers. In 2004 and 2005, the Alliance organized and managed the Potomac River Sojourn in full partnership with the Interstate Commission on the Potomac River Basin (ICPRB). Sojourners experienced the River's resources, explored important wayside sites, and spread a colorful stewardship message along the way. Educational activities were held daily and delivered on the water, at lunch stops, rest breaks and during the evening programs.

The Alliance River Sojourns are conducted to reach the general public and communities surrounding the selected Bay tributaries through programs presented during the trip. These programs provide opportunities for participants to learn about river resources and river-related problems. The sojourns instill a renewed sense of river stewardship, which in turn inspires participants to share their experiences with others to help promote the protection and restoration of the river.

*Potomac River Water Trail*

North American Water Trails, Inc., a national coalition of organizations and individuals committed to creating water trails, defines a water trail as". . . a stretch of river, a shoreline, or an ocean that has been mapped out with the intent to create an educational, scenic, and challenging experience for recreational canoers and kayakers." A water trail can be almost everything a hiking trail can be: short or long, primarily historic or scenic, challenging or laid-back (www.seakayack.ws/kayack/kayack.nsf/navigationlist/nt000026ee ). A water trail provides a unique venue to experience the splendor of a select river or waterway with added depth and richness.

The Potomac River Water Trail stretches approximately 300 miles, through West Virginia, Maryland, Virginia, and Washington, D.C., between Jennings Randolph Dam and the confluence of the River with the Chesapeake Bay. This waterway meanders past some of the richest landmarks in our Nation's history, including the Chesapeake and Ohio Canal National Historical Park, historic Alexandria, Mount Vernon, George Washington's Birthplace and Saint Mary's City (the site where Maryland was founded and the colony's first capital), and Robert E. Lee's family home. On this stretch of river, teachers experience a wide variety of landscapes, from remote wilderness to highly developed urban areas.

The Potomac River Water Trail is considered an integral part of the Potomac Heritage National Scenic Trail concept, providing many opportunities to explore this beautiful waterway and the historical and cultural opportunities that are encountered along the way. "Like a land trail, the Potomac River Water Trail offers users diverse experiences — from short trips to enjoy the sights and sounds of the River — to prolonged excursions to explore a natural or historical theme in-depth. Some choose to combine boating with other outdoor pursuits. With a bit of planning, for example, one may choose to hike along the C&O Canal Towpath, drop in a canoe or kayak at a designated canoe access area, canoe down the river, and camp at one of many designated camping areas. Various outfitters throughout the corridor are available to help with the planning and logistics involved in such a trip" (http://www.potomactrail.org/inventory/segments/water.html ).

*Potomac River Sojourn, the Potomac River Water Trail and Teacher Training*

A series of Potomac River Water Trail maps have been produced highlighting access points, sites of historical interest, the availability of restrooms and camping, food services, picnic and parking areas, and other helpful information such as safety tips and emergency contact numbers. These maps will serve as essential planning tools to conduct guided teacher training programs on the Potomac River. The Potomac River Sojourn, specifically, and organized trips on the Potomac River Water Trail, generally, have the potential to offer professional development opportunities in the field of environmental education for teachers in Virginia, Maryland and the District of Columbia, by involving and exposing them to various monitoring and restoration activities in a unique outdoor classroom. A programmatic focus on the Potomac River Sojourn and on Potomac River Water Trail excursions provide valuable and unique professional development for teachers and assist them with providing a meaningful Bay experience to their students.

The Alliance, with various project partners, envisions reaching out to the teaching community in an effort to help support the goals and initiatives of the Chesapeake Bay 2000 Agreement. This voluntary agreement, signed by the Chesapeake Executive Council will guide Maryland, Pennsylvania, Virginia, the District of Columbia, the Chesapeake Bay Commission and the U.S. Environmental Protection Agency (EPA), obligates each to implement measures to improve the Bay ecosystem through living resources restoration and protection efforts through the year 2010. Under the *Stewardship and Community Outreach* section of the agreement there are specific "education and outreach" goals. A teacher-training component on the Potomac River Sojourn or the Potomac River Water Trail would address the following goals set forth in the Education and Outreach portion:

- Beginning with the class of 2005, provide a meaningful Bay or stream outdoor experience for every school student in the watershed before graduation from high school.

- Provide students and teachers alike with opportunities to directly participate in local restoration and protection projects, and to support stewardship efforts in schools and on school property.

- Continue to forge partnerships with the Departments of Education and institutions of higher learning in each jurisdiction to integrate information about the Chesapeake Bay and its watershed into school curricula and university programs

The Alliance and project partners will select monitoring and restoration activities, sample curriculum items, and recruit additional stakeholders and partners to address these goals above.

Training programs can be conducted on the Potomac River during Sojourns or Water Trail experiences where teachers may participate in daily canoe or kayak travel, over night camping, and various educational and monitoring activities during the trip. In addition to regularly scheduled Sojourn or Water Trail programs and learning opportunities, teachers will participate in additional training exercises to create lesson plans to be used in their classes based on their specific set of academic learning standards. Future guided trips on the Potomac Water Trail could be developed for teachers using the activities of the 2005 Potomac River Sojourn as a model. In 2005 programs and activities included ghost tours of Antietam Battlefield, archeological site visits, fish seining and macroinvertebrate sampling, water quality monitoring, a sustainable agriculture presentation, and a USGS gauge station presentation.

**Potential Partners: Potomac River Sojourn and Water Trail Activities**

There are a variety of potential partners within the Potomac River watershed, many with educational and outreach expertise, that could be involved in future teacher-training opportunities on the Potomac River Sojourn and Water Trail. The Alliance has coordinated with many local agencies and various organizations to plan each river sojourn in the past; the same organizations and agencies could be involved in conducting guided trips on the Potomac Water Trail offering similar types of educational programs. Past Sojourn partner organizations have included state departments of natural resources, county tourism offices, soil and water conservation districts, universities and colleges, museums, camps, local parks, outdoor clubs, federal agencies, and other non-profits. Together the Alliance and partner organizations have planned specific Sojourn routes and logistics, restoration projects, programs, and activities to be held during the duration of the trip.

In addition to these planning partners, the Alliance would also coordinate with state departments of education, science content specialists, and the education and outreach departments of each state environmental and/or natural resources agency to promote the participation of teachers on the Potomac River Sojourn and in Potomac Water Trail activities. Other potential partners within the Potomac River watershed to assist with on-the-water programming, teacher training activities, logistics and planning efforts, and outreach and teacher recruitment include:

- Interstate Commission on the Potomac River Basin
- Maryland Department of Natural Resources
- National Park Service (especially the "Bridging the Watershed" program and "teacher-ranger-teacher" arrangements)
- Potomac Watershed Partnership
- Potomac Conservancy
- Maryland Association for Environmental and Outdoor Education (MAEOE)
- Anacostia Watershed Partnership
- Living Classrooms
- Earth Conservation Corps
- Virginia Department of Environmental Quality
- Virginia Department of Conservation and Recreation
- Northern VA Regional Park Authority
- Virginia Naturally
- local businesses

**Potential Sojourn and Water Trail Monitoring and Restoration Activities**

There are a variety of monitoring and restoration activities that have been incorporated on past Alliance Sojourns that can be duplicated in a Water Trail setting to provide valuable teacher training opportunities. The Alliance envisions working with various project partners to offer hands-on environmental education training for teachers to then take back into their classrooms and field studies. Depending on the stretch of river covered, programs would be developed and tailored to the ecological features, historical and cultural sites encountered, and communities visited. In the past, Sojourns have included presentations and demonstrations of water quality monitoring, submerged aquatic vegetation (SAV) groundtruthing and planting, archeology, discussions of historical battles and Native American culture, tours of marshes and wildlife areas, history of plantations, aquaculture facility tours, plant and bird identification hikes, and natural resource explorations. These educational programs and presentations can then tie into the restoration component of the Sojourn or Water Trail expedition.

Depending upon suitable locations along the river, teachers and community volunteers can participate in various restoration activities. In the past, Sojourn restoration activities have included SAV plantings, marsh grass plantings, riparian buffer plantings, *BayScape* demonstration gardens, birdhouse and kiosk building for Parks, and stream clean ups to name a few. It is the goal that these teachers will be empowered with the restoration skills and ideas for potential community partnerships to then duplicate a project on their school grounds or within their community. The Alliance and project partners will present information on how a similar community restoration event may be planned and developed within the classroom setting, volunteer outreach and recruitment strategies, techniques for long-term maintenance, and how to generate donations for the project.

In addition to participating in hands-on monitoring and restoration activities, teachers will also have the opportunity to integrate a reflective element into their river experience through "nature journaling." Daily programs will be developed to encourage teachers to reflect upon their experiences and generate ideas on how what they have learned can be translated back into their classroom setting. They will be given guided activities that will incorporate creative writing assignments, drawing, plant and animal identification using field guides, and other exercises to hone their observation skills. Teachers will be encouraged to share their journal entries each evening to generate conversation and share ideas among other teachers. This Nature Journaling activity can easily be translated back into the classroom setting to meet many science, visual art, and English standards of learning. The overall Sojourn or Water Trail experiences are not just about environmental education, but should incorporate all academic disciplines.

*Teacher Training*

With respect to the teacher-training component, Alliance staff, project partners, and teachers would participate in meetings each day in addition to scheduled Sojourn or Water Trail activities. The first meeting on the gathering day of the trip would be an introductory meeting in which the teachers would get to know one another and the goals and expected outcomes would be clearly identified. Over the next few days, the meetings will introduce teachers to already existing curricula as it relates to scheduled environmental programming. The group will run through the example lessons and demonstrations and compare these lessons to their experiences thus far on the Sojourn or Water Trail expedition.

A folder of educational resources would be provided for each teacher consisting of information pertaining to the Potomac River, Chesapeake Bay facts, sample lesson plans, copies of each state's academic learning standards, and notes on all of the programs offered during the week with pointers on how to incorporate them into lesson plans to fit with the required standards. The remaining teacher meetings would focus on creating lesson plans that can be used in the classroom and field settings based on their Sojourn and Water Trail experiences. For example, water quality monitoring could be conducted during the course of the Sojourn and Water Trail trips. Alliance staff and project partners would model how to create a lesson plan based on this activity. Discussions of water quality, its relationship to SAV survival, causes of decline, and current measures being taken to restore

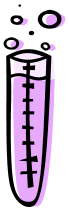
water quality will be included in the lesson plan. All of these factors would be presented through programs on the river.

Analysis of water quality data would be preformed, utilizing math skills, and developing research skills. These activities would then be transferred into a lesson plan. During the follow up meetings with teachers, lesson plans will be discussed and critiqued. Teachers and project partners would then brain storm ideas for other lesson plans, and be given time to develop at least two lesson plans throughout the remainder of the trip. Teachers would be required to submit these final lesson plans to the Alliance and project partners, which would then circulate them to all of the teachers participating in the Sojourn or Water Trail event for future use.

Teachers would then incorporate the lessons that they and other teachers created into their own classes. The Alliance and project partners would plan a follow up activity in which the teachers will share their teaching experiences related to the lessons created during the Sojourn or Water Trail event with other teachers who participated by state. Following this meeting, the Alliance and project partners would coordinate with the teachers to encourage them to share this information with other faculty in their school or school district. Teachers would be provided a list of opportunities for outdoor field events in which they could have their students participate to assist with the meaningful Bay experience goal.

An evaluation component would be integrated into each Sojourn and Water Trail event where success will be determined by the number of participating teachers and the number of lesson plans created as a result of the Sojourn or Water Trail programs. Success of the lessons conducted in the classroom would also be taken into consideration. Alliance and project partner staff would review evaluation forms completed by the teachers and weigh the results of the follow-up meetings. Adjustments will be made to improve the teacher training activities and structure for future Sojourns and Water Trail events, and some could be invited to serve as Sojourn or Water Trail "Rangers" through a National Park Service "Teacher-Ranger-Teacher" funded by a "Parks as Classrooms" program.

**Sample Monitoring Activities and Lesson Plans**



*Water Quality Monitoring*

Since 1985, the Alliance has been training and empowering citizens to collect water quality data throughout the Bay watershed. The Alliance Citizen Monitoring program is a regional network of more than 145 trained volunteers who perform weekly water quality tests that help track the condition of waters flowing toward the Chesapeake Bay. These dedicated volunteers monitor rivers across the Chesapeake region in Pennsylvania, Maryland and Virginia. Some have worked with the Alliance for more than ten years, watching their rivers through the seasons and regularly submitting the valuable data they collect.

Along the way, the Alliance has become a leader in volunteer monitoring programs. Our program coordinators have shared sampling procedures, reporting formats, and a specialized computer data management system with environmental groups across the country. The Alliance staff would use their experience and expertise to guide teacher training water quality monitoring activities during the Potomac River Sojourn and Water Trail outings. Tests for dissolved oxygen, pH, water clarity, and other parameters, would be preformed during river travel and comparison would be made based on the data collected. Focused discussion and lesson plans would be developed so participating teachers could then utilize the information in the classroom.

Teachers would be trained how to use "Green Kits" which contain the basic equipment for school based water quality monitoring programs. These kits are relatively inexpensive and contain easy to use Test Tab methods. A series of procedural sheets would be given to each teacher explaining the monitoring parameters and sample water quality lessons for classroom use will be included. Students will also have an opportunity to conduct web

based research projects to track and analyze water quality monitoring data from around the state or country. Students could also conduct such projects as long term monitoring of a local water body and tracking changes over an entire school year, incorporating technology by analyzing and uploading data, comparing water quality to the diversity of macroinvertebrates etc. See the *Water Quality Monitoring* appendix for procedural sheets and sample lessons.

Further Water Quality Monitoring Reference Information:

http://www.green.org : This web site is designed to provide water monitors and students with a place to store their water monitoring data, track their water monitoring projects, and to provide links to a variety of educational resources to successfully implement a school-based water monitoring program. There is a feature that allows others to view your water quality data and compare your findings to the findings of others in your area.

http://www.acb-online.org/project.cfm?vid=87 : The Alliance Citizen Monitoring homepage

*SAV groundtruthing/monitoring*

In 1996, the Alliance initiated an innovative restoration project that combines our experience with habitat restoration and volunteer monitoring. In partnership with the National Marine Fisheries Service, the Alliance is working with volunteers to transplant and monitor underwater grasses at two sites on St. Mary's River in Maryland, where Bay grasses once thrived. Bay grasses provide critical habitat for blue crabs and other living resources.

Past Sojourn activities have included programs on the importance of SAV habitat in the Chesapeake Bay ecosystem and monitoring activities during river travel. Alliance staff and project partners would provide teachers with equipment and brief SAV identification training so they could scout for various underwater grasses as they paddled on the Potomac River Sojourn or Potomac Water Trail. Any grasses found would be identified by type and their location on laminated maps. Alliance staff scientists would be "on call" during the paddle, at rest breaks, and at the evening campsite to assist teachers with plant identification. Any grasses found will be summarized and sent to the US Fish and Wildlife Service as part of the "Citizens SAV Hunt" program, where it will eventually be sent to the Virginia Institute of Marine Science (VIMS) to aid efforts for the important annual SAV survey that is preformed by the Chesapeake Bay Program.

Teachers can develop lesson plans to set up an SAV monitoring program in a local stream or tributary near their school and involve their students in various activities such as mapping skills, plant identification, how SAV survival and health relates to water quality, the importance of SAV habitat in the ecosystem, how SAV "grass" differs from the schoolyard grass, using field guides, and assistance in uploading SAV information onto the VIMS web site. See the *SAV Monitoring and Groundtruthing* appendix for sample activities and survey forms.

For Further SAV Reference Information:

http://tethys.vims.edu/savwatch/index.cfm : This is the location of the Virginia Institute of Marine Science (VIMS) SAV Watch including maps and data sheets, procedural instructions, further references, field guides and more.

http://www.vims.edu/bio/sav/ : This is the main VIMS website for SAV.

*Biological Monitoring*

The Alliance has conducted various biological monitoring activities throughout the years on River Sojourns. Specifically, we have worked with the Virginia Save our Streams and other watershed organizations to conduct macroinvertebrate sampling on Chesapeake Bay tributaries. Teachers traveling on the Potomac River Sojourn or Potomac Water Trail would have the opportunity to obtain a snapshot of the health of the river by seeing what critters live in the water using seine nets. Macroinvertebrates will be identified using various field guides and identification cards and a discussion of the findings as they relate to water quality will ensue. Teachers will have the opportunity to develop lesson plans based on the findings where potential activities for students may include learning to use field guides, anatomy and physiology of macroinvertebrates, how the presences of certain macroinvertebrates relate to water quality, journal sketches, terrestrial insect identification and field sketches on the school grounds etc. See the *Biological Monitoring* appendix for sample lessons.

Further Biological Monitoring Reference Information:

> http://www.sosva.com/vasosmonitoring.htm: This web site contains various biological monitoring protocols used by Virginia Save Our Streams

*Restoration Projects:*

On past Alliance Sojourns, many restoration projects have been implemented from *BayScape* demonstration gardens, kiosk building on parklands, riparian buffer plantings, SAV plantings, and other on-the-ground projects linking the surrounding community and Sojourners. It is a wonderful way to promote stewardship within the communities visited and promotes an exchange of resources and ideas. These types of restoration projects could easily be duplicated on Water Trail trips as well as in the classroom setting. Teachers traveling on the Potomac River Sojourn or Water Trail activities will gain the technical experience of, for example, the proper way to plant trees and maintenance considerations. Again, it is the goal that these teachers will be empowered with the restoration skills and ideas for potential community partnerships to then duplicate a project on their school grounds or within their community. The Alliance and project partners will present information on how a similar community restoration event may be planned and developed within the classroom setting, volunteer outreach and recruitment strategies, techniques for long-term maintenance, and how to generate donations for the project.

Teachers will have the opportunity to brainstorm types of schoolyard and community based projects as well as potential partners and stakeholders. Some examples of school based restoration/community outreach projects include: recycling programs, native plant and vegetable demonstration gardens incorporating rain barrels, a community stream clean up, a rain garden creation and planting, and other means to connect with the local community. Students could fulfill English requirements by writing a community outreach campaign for the selected restoration projects, drafting letters for support and donations, coordinating with local media (newspapers, T.V. etc.), starting a web based campaign, or starting a project newsletter. As well, various science and environmental based activities could be incorporated depending on the restoration project selected. See the *Restoration Project* appendix for sample lessons.

Further Restoration Project Reference Information:

> http://www.chesapeakebaytrust.org/projectsuggestions1.html : This site from the Chesapeake Bay Trust, has various suggestions for school based restoration projects to help restore then Chesapeake Bay.
>
> http://www.nwf.org/campusecology/dspGreeningProjects.cfm?iid=7 : Examples from the National Wildlife Federation of school based native plant restoration projects from around the country.

*Nature Journaling:*

Nature Journaling is an amazing way to incorporate a variety of educational disciplines into a creative environmental activity. Teachers traveling on the Potomac River Sojourn or a Potomac Water Trail event would have the opportunity to experience the power of nature journaling by keeping a trip journal and participating in guided activities that will incorporate creative writing assignments, drawing, plant and animal identification using field guides, and other exercises to hone their observation skills. Daily programs will be developed to encourage teachers to reflect upon their experiences and generate ideas on how what they have learned can be
translated back into their classroom setting. Again, teachers will be encouraged to share their journal entries.

This Nature Journaling activity can easily be translated back into the classroom setting to meet many science, visual art, and English standards of learning. There are an endless number of possibilities to incorporate the nature journals into classroom activities; the possibilities are only limited by imagination. This is a wonderful tool to hone observation and writing skills, to incorporate the visual and creative arts, and create a sense of interconnectedness and develop a personal relationship with nature. See the *Nature Journaling* appendix for sample lessons, resources, and articles.

Further Nature Journaling Reference Information:

www.pacifier.com/~mpatters/details/details.html: Wonderful website with great lessons on field sketches.

www.amnh.org/nationalcenter/youngnaturalistawards/resources/fieldjournal.html
How to Keep a Field Journal – American Museum of Natural History. Another great site!

http://42explore.com/journl.htm: This site contains a wealth of nature journaling activities, ideas, lesson plans, and further resources.

**Conclusion**

The Potomac River offers a dynamic and unusual "living classroom." This report provides some ideas and directions for future Potomac River Sojourns and Potomac River Water Trail experiences to offer unique training opportunities for teachers from the District of Columbia, Virginia, and Maryland to conduct and become exposed to a variety of hands-on environmental monitoring and restoration activities for use in the classroom and future field studies. The report suggests potential partnerships, restoration and monitoring activities, ways that teachers might incorporate such activities into classroom and field settings, and ways to structure a teacher training program. The full report also includes sample lesson plans for each monitoring or restoration activity mentioned and additional teacher training and education resources. These ideas, along with suggestions from project partners, can serve as a blueprint for the development of a teacher-training program on future Potomac River Sojourn or Potomac Water trail excursions; as a grant template to fund such a program; and as a catalyst to develop similar programs using "parks as classrooms."

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# Web-Based Teacher Resources

**Departments of Education:**

Maryland Department of Education: http://www.marylandpublicschools.org/msde

Virginia Department of Education: http://www.pen.k12.va.us

District of Columbia Department of Education: http://www.k12.dc.us/dcps/home.html

**Curriculum/ Environmental Education Resources:**

http://www.nps.gov/learn : The National Park Services' host of edcuaitonal materials, curricuclum, Junior Ranger informaiton and Parks and Classrooms resources.

http://www.plt.org : Project Learning Tree, an award winning environmental education program designed for teachers, educators, parents and community leaders working with youth grade K-12.

http://www.wetland.org/wowteacher.html : Environmental Concern's Wonders of Wetlands curriculum site.

http://www.projectwet.org : Project WET (Watershed Education for Teachers) site, offers water education resources and curriculum items for educators of youth ages 5- 18.

http://www.globe.gov/globe_flash.html : The GLOBE (Global Learning and Observations to Benefit the Environment) site; a worldwide hands-on, primary and secondary school-based education and science program.

http://www.chesapeakebay.net/index_teachers.cfm : This Chesapeake Bay Program site is design to help teachers and educators find the resources they need to effectively teach about the many important facets of the Chesapeake Bay. There is a wealth of information from curriculum ideas, facts sheets and various other teaching resources and sites of interest.

http://www.schoonerrace.org/education_links.htm : This site from the Mariner's Museum provides various teacher resources and other helpful Chesapeake Bay education links.

http://www.vanaturally.com : Virginia Naturally site, provides state wide environmental education resources, partners, grant opportunities, and curriculum items.

http://www.maeoe.org : Maryland Association for Environmental and Outdoor Education site.

# Chesapeake Bay Resource Page

Visit this Virginia Institute Of Marine Science (VIMS) web page to access the links and the information on various Chesapeake Bay education resources listed below: http://www.vims.edu/bridge/chesapeake.html

**General Resources**

ChesSIE: Chesapeake Science on the Internet for Educators - A web-based resource center and communications hub that supports K-12 Chesapeake Bay science education. ChesSIE provides educators with bay-related teaching resources, field trip information, activities, lesson plans, and state resources.

Chesapeake Bay Program - A unique group that encompasses federal and state government and local agencies, CBP offers information about the Bay, its flora and fauna, habitats, water quality, environmental concerns, and restoration efforts, plus provides access to scientific data.

Alliance for the Chesapeake Bay - Find out how to get involved with this non-profit organization dedicated to the restoration of the Chesapeake Bay. The website contains descriptions of its programs plus an online version of their newsletter, *Bay Journal*.

Chesapeake Bay Foundation - An environmental organization dedicated to "saving the Bay." Website topics include environmental education, getting involved, a Bay almanac, and a state of the Bay progress report.

Maryland Department of Natural Resources: Chesapeake Bay - A comprehensive site on Maryland's Chesapeake Bay monitoring, restoration, and education efforts, plus information on other hot topics such as sea grasses and *Pfiesteria*.

Virginia Department of Environmental Quality (DEQ): Chesapeake Bay Program - Learn about the Chesapeake Bay Program (a multi-governmental, interstate, cooperative partnership) and its strategies and action plans to help restore the Bay.

**Educational Resources**

ChesSIE: Chesapeake Science on the Internet for Educators - A web-based resource center and communications hub that supports K-12 Chesapeake Bay science education. ChesSIE provides educators with bay-related teaching resources, field trip information, activities, lesson plans, and state resources.

Bay Link - A collaboration between several Virginia-based, bay-related organizations, this educational website includes lesson plans, field trips, and student projects/activities.

Living Bay Online - An interactive resource about oysters, algae and the Chesapeake Bay. Teacher resources include 10 lesson plans, and student resources include a variety of quizzes, a detective game and a population estimation challenge. Appropriate for grades 5, 6, 7 and 8.

Chesapeake Bay Program for Teachers - Offers educational tools for teaching about the Chesapeake Bay including online factsheets, lesson ideas, powerpoint presentations, and more for all grade levels.

Watersheds: Where the Atmosphere Meets the Earth -This highly interactive site has in-depth information about Chesapeake Bay watersheds and coastlines. Site includes activities, quizzes, vocabulary terms, movie clips.

Blue Crab Education Page - Information compiled by the Virginia Institute of Marine Science on the anatomy, life cycle, ecology, and fisheries of the blue crab.

Bay B C's -An online multidiscplinary activity guide for grades K-3 offering background information and lesson ideas concerning the Chesapeake Bay.

**Science & Research**

ChesSIE: Chesapeake Science on the Internet for Educators - A web-based resource center and communications hub that supports K-12 Chesapeake Bay science education. ChesSIE provides educators with bay-related teaching resources, field trip information, activities, lesson plans, and state resources.

USGS Activities in the Chesapeake Bay Region - Connect to USGS projects on the Chesapeake Bay including weather, land use, population & urban, atmospheric deposition, geology, mapping, biology, streamflow, water quality, wetlands, sediment, and ground water activities.

Ecosystem Trends and Response: Chesapeake Bay (USGS) - Information on the Chesapeake Bay, the critical issues for its management and restoration, recent dissolved oxygen and SAV trends, and the USGS Ecosystem Response Project.

Chesapeake Bay: Measuring Pollution Reduction (USGS) - Addresses the following questions about the Bay: How much nutrient pollution enters the Bay each year from its major tributaries? What is being done to reduce nutrient pollution? How is nutrient-pollution reduction being determined? Are the steps taken to reduce nutrient pollution working?

SAV in Chesapeake Bay - Information about submerged aquatic vegetation (SAV), SAV habitat requirements, restoration efforts, and distribution data.

**Data**

ChesSIE: Chesapeake Science on the Internet for Educators - A web-based resource center and communications hub that supports K-12 Chesapeake Bay science education. ChesSIE provides educators with bay-related teaching resources, field trip information, activities, lesson plans, and state resources.

Chesapeake Bay Program Data Hub - Chesapeake Bay Program's data network providing acesses to water quality, benthic, fisheries, point source, plankton, and monitoring databases.

Chesapeake Bay River Input Monitoring Program (USGS/DEQ) - Data from the USGS that tracks the amount of nutrients (such as nitrogen and phosphorus), suspended material, and other potential contaminants entering the Bay from nine major rivers over the last ten years.

Chesapeake Bay Observing System (CBOS) - Real-time data from two stations in the Chesapeake Bay. Data include air temperature, wind speed & direction, barometric pressure, humidity and salinity data.